5-2002

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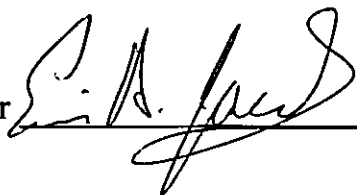
Discounting of Delayed Consequences

in Women with a History of Abuse

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Abstract

Women with a history of abuse often have difficulty escaping abusive relationships. One

potential factor that may influence this behavior is inappropriate sensitivity to delayed or

diffused outcomes. The purpose of this research was to obtain measurements of

sensitivity to delayed consequences in women with histories of abuse. Participants

engaged in a hypothetical money choice task to determine the relative subjective value of

delayed rewards. A quantitative model relating delay to subjective value was fit to each

the data. Based upon comparison with data previously reported in the literature, women

with histories of abuse discount delayed rewards to a lesser degree than the general

population. Women with histories of abuse may be less impulsive and show signs of

hypersensitivity to long-term outcomes. This may contribute to the individual sustaining

an abusive relationship in hopes that the relationship will prove beneficial in the long run.

Discounting of Delayed Consequences in Women with Histories of Abuse

Understanding the behavioral characteristics of women with histories of abuse may aid in the development of effective treatment and prevention programs. In a recent study of personality profiles of abused mother-daughter dyads, both the mothers and the daughters were found to be to be less impulsive than controls (Muram, Rosenthal, & Beck, 1994). High levels of anxiety were also noted in sexually assaulted women (Valliant, Maksymchuck & Antonwicz, 1995). Valliant and colleagues hypothesized that a high level of anxiety might also lead to decreased impulsivity (Valliant et al., 1995). This lack of impulsivity may lead to inappropriate weight given to long-term consequences, and thus enable individuals to remain in an abusive situation for hopes of better outcomes in the future.

Personality measures of abused individuals also indicate that they have lower perceptions of personal control than control subjects (Umberson, Anderson, Glick, & Shapiro, 1998). Lack of personal control has been negatively correlated with impulsivity (Umberson et al., 1998; Valliant et al., 1995). Because women with histories of abuse show less impulsivity and low feelings of personal control (Umberson et al. 1998; Valliant et al. 1995), they may not show appropriate sensitivity to punctuated episodes of abuse and may have difficulty terminating abusive relationships.

Systematically replicating the lower levels of impulsivity in women with histories of abuse using quantitative methods to assess self-control would extend the external validity of personality research. Within the laboratory, "self-control" has been operationally defined as the preference for a larger-later reward (LLR). "Impulsivity," conversely, has been defined as a preference for a smaller-sooner reward (SSR). Rachlin,

Raineri, and Cross (1991) introduced a hypothetical money choice task to assess temporal

discounting of delayed rewards. The task involves making repeated choices between a

larger-later reward and a smaller-sooner reward. The amount of the SSR is adjusted

across trials until the participant is indifferent between the SSR and the LLR. The delay

to the LLR is adjusted across conditions to obtain a series of indifference points. An

indifference curves is then constructed by plotting the individual indifference points

across time (Rachlin, Raineri & Cross, 1991). The indifference curves obtained by

Rachlin, Raineri and Cross were well described by the following a quantitative model of

delay discounting, introduced by Mazur (1987):

$$V = A / (1 + KD) \tag{1}$$

Where $\underline{V}$ is the present discounted value (i.e., the indifference point) of a reward of

magnitude $\underline{A}$ (always $1000) received after time delay $\underline{D}$ and $\underline{K}$ is a free parameter that is

correlated with the degree of delay discounting (Mazur, 1987).

The free parameter $\underline{K}$ from Equation 1 provides an index of "impulsivity" that is

useful for comparing across populations or conditions. Figure 1 shows hypothetical

indifferences curves showing present subjective value of $1000 as function of delay.

Individual curves show the different degrees of delay discounting obtained for values of

$\underline{K}$ ranging from 0.001 ("less impulsive") to 0.1 ("more impulsive)". Note that as $\underline{K}$

increases, the indifference curve becomes more L-shaped, indicating that subjective value

decreases more rapidly at relatively short delays.

Data supporting the external validity of the hypothetical money choice task as a

measure of "impulsivity" is mounting. Madden and colleagues extended use of the

hypothetical money choice task to compare the sensitivity to delayed consequences of

opioid-dependent outpatients to that of control participants that were matched on I.Q., age, income, education, and gender (Madden, Petry, Badger, & Bickel, 1997). The $\underline{K}$ values obtained with substance abusers were significantly higher than those obtained with the matched controls.

This finding has been replicated with a variety of substance abusing populations also including alcoholics, heroin addicts and cigarette smokers (Allen, Moeller, Rhoader, & Cherek, 1998; Bickel, Odum, & Madden, 1999; Kirby & Marakovic, 1995; Kirby, Petry, Bickel, 1999; Madden et al., 1997; Petry, 2001;). For example, a study by Bickel, Odum, & Madden (1999) compared the degree of delay discounting between current smokers, ex-smokers, and never smokers. Current smokers were found to discount the monetary rewards more significantly than ex-smokers and non-smokers. Interestingly, never and ex-smokers did not differ significantly in discounting of delayed monetary reinforcement. Thus, differences in the sensitivity to delayed consequences of the participants may have accounted for the differences in the ability to quit.

The hypothetical choice task is proving to be a very sensitive method for assessing the differences in delay discounting among highly impulsive populations. Petry (2001) assessed delay discounting in substance abuse with and without gambling problems. Not only did the substance abusers once again discount to a higher degree than controls, but those individuals who had substance abuse disorders and pathological gambling discounted to a higher degree than individuals with only substance abuse problems. In a similar fashion, Odum and colleagues (Odum, Madden, Badger, Bickel, 2000) assessed delay discounting in opioid-dependent outpatients who expressed willingness to share needles and opioid-dependent outpatients who did not. Those who

were willing to share needles discounted to a higher degree than those who would not (Odum, Madden, Badger, Bickel, 2000). These studies show the sensitivity of the hypothetical choice task.

In the present study, use of the hypothetical money choice task has been extended to assess sensitivity to delayed consequences in women with histories of abuse in order to systematically replicate the findings of previous work using personality assessments. If hypersensitivity to delayed outcomes is a key variable underlying susceptibility to abuse, women with histories of abuse should discount delayed rewards to a lesser degree than members of the general population. Thus, $\underline{K}$ values obtained with women with a history of abuse should be lower than $\underline{K}$ values obtained with members of the general population.

<div align="center">Methods</div>

Participants

Ten women who had been in an abusive relationship for six months or longer participated in the study. All of the women were currently undergoing therapy and were recruited from a shelter for battered women. Their therapist recruited and screened all individuals interested in participation. Participants were compensated five dollars for their participation. The experiment took one hour-long session.

Design and Procedure

Participants were greeted and seated in a private room. A copy of the consent form was given to the participant, and it was read aloud by the experimenter. When the woman chose to continue participation both the participant and the researcher signed the form.

The demographic questionnaire was then presented to the subject. After the questionnaire was complete the discounting exercise began. Participants were now read a standard set of instructions (see appendix) and asked to make repeated choices between a delayed hypothetical monetary reward and immediate hypothetical monetary rewards of equal or lesser value. At each of seven delays (one week, two weeks, one month, six months, one year three years, and ten years), participants made repeated choices between $1000 to be received after the delay and a monetary amount of equal or lesser values to be received immediately. The value of the immediate reward was adjusted across choice trials. The time delay and money rewards were written on 3X5 index cards. The researcher asked for the least amount the participant would be willing to take- the larger delayed reward or the smaller sooner reward. After the participant indicated a preference, the value of the immediate reward was changed and another choice trial began. This procedure continued until all 27 of the immediate reward values were presented. The immediate reward values were initially presented in descending order and were then presented in ascending order. The time delays were presented in either ascending or descending order (counterbalanced across subjects). After the discounting exercise was completed the participants were read a debriefing statement and all further questions were answered.

Results

Data Analysis

At each delay value, the researcher recorded where in the series of reward values preferences shifted from the immediate reward to the delayed reward on each pass through the immediate reward values. The mean of the switch points from each pass

through the immediate reward values served the indifference point where the discounted

value of the larger delayed reward equals the value of the smaller, immediate reward.

Indifference points were obtained at each of the delay values. The seven indifference

points were fitted to Equation 1 using Excel®. Equation 1 has been shown to be reliable

in assessing $\underline{K}$ as a free parameter (Madden, Bickel, & Jacobs, 1999). The obtained $\underline{K}$

valued served as an index of sensitivity to delay.

Figure 2 shows the medians of the individual indifference points obtained at each

of the seven delay values. The solid line shows the best-fit indifference curves for these

points. The obtained $\underline{K}$ value was 0.00524. The obtained R^2, which is the percent of

variance accounted for, was only 34%. The obtained R^2 value is considerably lower than

that typically obtained for indifference curves obtained with these methods (e.g., Madden

et al., 1997; Rachlin et al., 1991). The bulk of the discrepancy between the model's

predictions and the obtained indifference points, however, occurred at rather long delays

(i.e., 25 years). The model severely underestimated the amount of money the women

were willing to take at longer delay periods. This discrepancy is consistent with the

hypothesis that women with histories of abuse are hypersensitive to delayed outcomes.

Discussion

Equation 1 provided an adequate description of the delay discounting data and the

majority of the error variance resulted from the model severely underestimating

subjective value at long delays. To test the hypothesis that women with histories of abuse

tend to be hypersensitive to delayed outcomes, the data obtained with women with

histories of abuse need to be evaluated against data obtained with similar individuals who

have not experienced abuse. Many of the women with histories of abuse suffered from

many comorbid problems (e.g., Post traumatic stress disorder, bi-polar syndrome, and traumatic brain injury). Unfortunately, gaining access to individuals with comparable disorders was not possible within the time-constraints of the project.

To evaluate whether women with histories of abuse discounted at unusually low rates, the results obtained in the present study can be compared to those obtained from the study by Madden and colleagues (1997), who compared the delay discounting of opioid addicts to matched controls. For valid comparison, the control group needs to be similar to the group of women with histories of abuse along a number of demographic characteristics that may be related to impulsivity. Table 1 shows the relevant demographics for the compared groups. The median education levels for the controls were comparable to those obtained from the abuse participant pool. The yearly gross income was comparable across both groups. The age median was very close, with 36.3 in the participant groups and mean of 36.4 in the control group. The only major demographic disparity between the groups was the presence of a male population within the control group. This is a significant disparity because personality inventories have revealed a small but significant difference in impulsivity levels of men and women (Garner, Percy, & Lawson, 1971). Nonetheless, the control group from the study by Madden and colleagues does provide a point of comparison for a tentative evaluation of the relative degree of delay discounting in women with histories of abuse.

Figure 3 shows indifference curves for the three populations—women with histories of abuse, opioid addicts, and matched controls. The indifference curves are drawn using Equation 1 and the $\underline{K}$ values obtained for each population. Figure 3 shows women with histories of abuse discounted delayed rewards to a lesser degree than the

opioid addicts and the matched controls. Albeit, the control group from the study by Madden and colleagues (1997) contained men and that may have contributed to the obtained differences in delay discounting.

These preliminary results tentatively support the hypothesis that women with histories of abuse overvalue delayed or remote outcomes. Interestingly, the comorbid problems women with histories of abuse tend to suffer from are correlated with higher levels of impulsivity. Two of the women with histories of abuse self-reported that they were diagnosed with Post Traumatic Stress Disorder (PTSD), and three self-reported that they were diagnosed as Bi-Polar. Both PTSD and Bi-Polar disorder have been correlated with increased impulsivity levels (Joesph, Dalgleish, Thrasher & Yule, 1996; Henry, Mitropoulou, New, Koenigsberg, Silverman & Siever, 2001). To have obtained relatively lower $\underline{K}$ values despite the effects of these comorbid disorders is noteworthy. Thus, women in abusive relationships may be hypersensitive to the potential for long-term benefits of the relationship and not appropriately assess the short-term costs of abuse.

These preliminary results suggest that therapy for women such as these should teach women to be more sensitive to punctuated, immediate episodes of abuse and appropriately discount the long-term outcomes of remaining in an abusive relationship. The delayed discounting exercise could also be used as a gauge for the therapist to measure how therapy is progressing or as an appropriate screen for which therapy may be effective.

These preliminary results also suggest that there is some utility in extending choice and decision-making procedures that have been developed in the laboratory to

clinical settings. Continued research in this area should focus on impulsivity as a facet of decision-making in women with histories of abuse. Assessing delay discounting in a suitable control group can extend the present study. Doing so would provide a strong test of the hypothesis that hypersensitivity to delayed outcomes is a factor that may contribute to women remaining in abusive relationships.

REFERENCES

Allen T., Moeller F.G., Rhoader H.M.,Cherek D.R. (1998). Impulsivity and history of

drug dependence. *Drug and Alcohol Dependence. 50,* 137-145.

Bickel, W.K., Odum, A.L., Madden, G.J. (1999). Impulsivity and cigarette smoking:

Delayed discounting in current, never, and ex-smokers. *Psychopharmacology. 146,*

447- 454.

Garner, J., Linda, M., Lawson, P., Lawson, T. (1971). Sex differences in behavioral

impulsivity, intellectual impulsivity, and attainment in young children. *Journal of*

Child Psychology and Psychiatry. 12, 261-271.

Henry, C., Mitropoulou, V., New, A., Koenigsberg, H., Silverman, J., Siever, L. (2001).

Affective instability and impulsivity in borderline personality and bi-polar disorders:

Similarities and differences. *Journal of Psychiatric Research. 35,* 307-312.

Joesph, S., Dalgleish, T., Thrasher, S., Yule, W. (1996). Impulsivity and post-traumatic

stress. *Personality and Individual Differences. 22,* 279-281.

Kirby K.N., Marakovic N.N. (1995). Modeling myopic decisions: evidence for

hyperbolic delay-discounting within subjects and amounts. *Organizational Behavioral*

Human Decision Processes. 64, 22-30.

Kirby K.N., Perty N.M., Bickel W. K. (1999). Heroin addicts have higher discount rates

for delayed rewards than non-drug using controls. *Journal of Experimental*

Psychological General. 128, 78-87.

Madden, G.J., Bickel, W.K., Jacobs, E.A.,. (1999). Discounting of delayed rewards in

opioid-dependent outpatients: Exponential or hyperbolic discounting functions?

Experimental and Clinical Psychopharmacology. 7, 284-293.

Madden G.J., Petry N.M., Bickerl K.W. (1997). Impulsive and self-control choices in

opoid-dependant patients and non-drug-using control participants: drug and monetary

rewards. *Experimental Clinical Psychopharmacology. 5*, 256-263.

Mazur, J. E. (1987). The effect of delay and of intervening events on reinforcement

value. *Quantitative analyses of behavior. 5*, 55-73. .

Muram, D., Rosenthal, T.L., Beck, K.W. (1994). Personality profiles of mothers of

sexual abuse victims and their daughters. *The International Journal of Child Abuse

and Neglect. 18*, 419-423.

Odum A., Madden G., Badger G., Bickel W. (2000). Needle sharing in opioid-dependent

outpatients: psychological process underlying risk. *Drug and Alcohol Dependence. 60*,

259-266.

Petry, N.M. (2001). Delay discounting of money and alcohol in actively using alcoholics,

currently abstinent alcoholics, and controls. *Psychoopharmacology.154*, 243-250.

Petry, N.M. (2001). Pathological gamblers, with and without substance abuse disorders,

discount delayed rewards at high rates. *Journal of Abnormal Psychology. 110*, 482-

487.

Rachlin, H., Raineri, A., and Cross, D. (1991). Subjective Probability and Delay. *Journal

of the Experimental Analysis of Behavior. 55*, 233-244.

Umberson, D., Anderson, K., Glick, J., Shapiro, A. (1998). Domestic violence, personal

control, and gender. *Journal of Marriage & the Family. 60*, 442-452.

Valliant, P.M., Maksymchuck, L.L., Antonowicz, D. (1995). Attitudes and personality

traits of female adult victims of childhood abuse: A comparison of university students

and incarcerated women. *Social Behavior & Personality. 23*, 205-215.

Author Note

Table 1 Demographic data for Women with Histories of Abuse (WWHA) and Control participants from Madden, Petry, Badger, and Bickel (1997).

| Variable	WWHA	Controls[a]
Age (in years)		
M (SD)	36.3 (7.1)	36.4 (10.7)
Years of Education		
M (SD)	12.4 (1.8)	13.8 (1.8)
Income ($)		
Median	$7,500[b]	$10,800
Interquartile range	$7,500-$18,500	$5,071-$18,600
% male	0	63

a—Data have been reprinted from

b—Medians and interquartile range estimated from categorical data. See text for details.
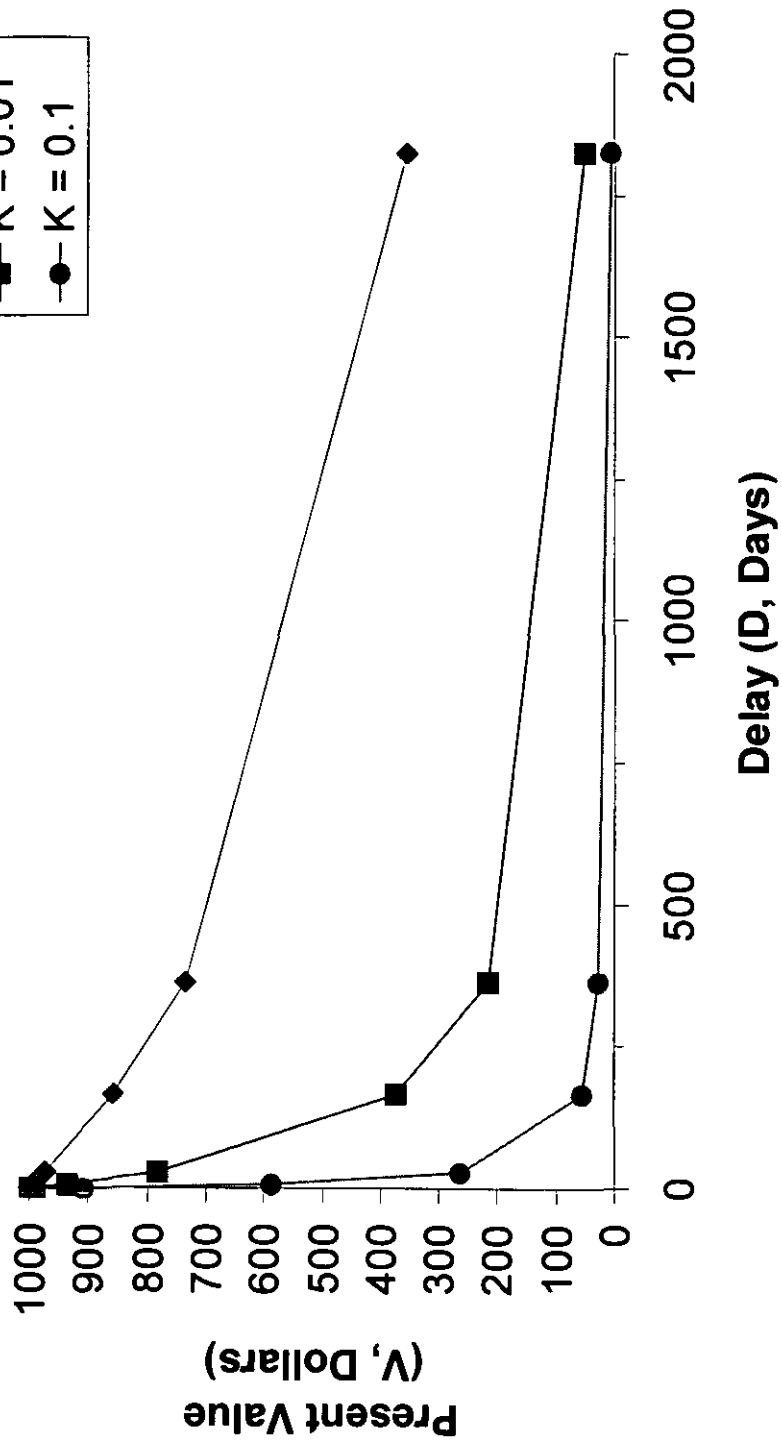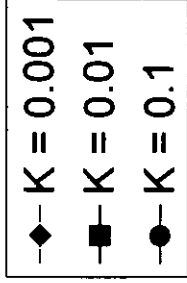
Figure Captions
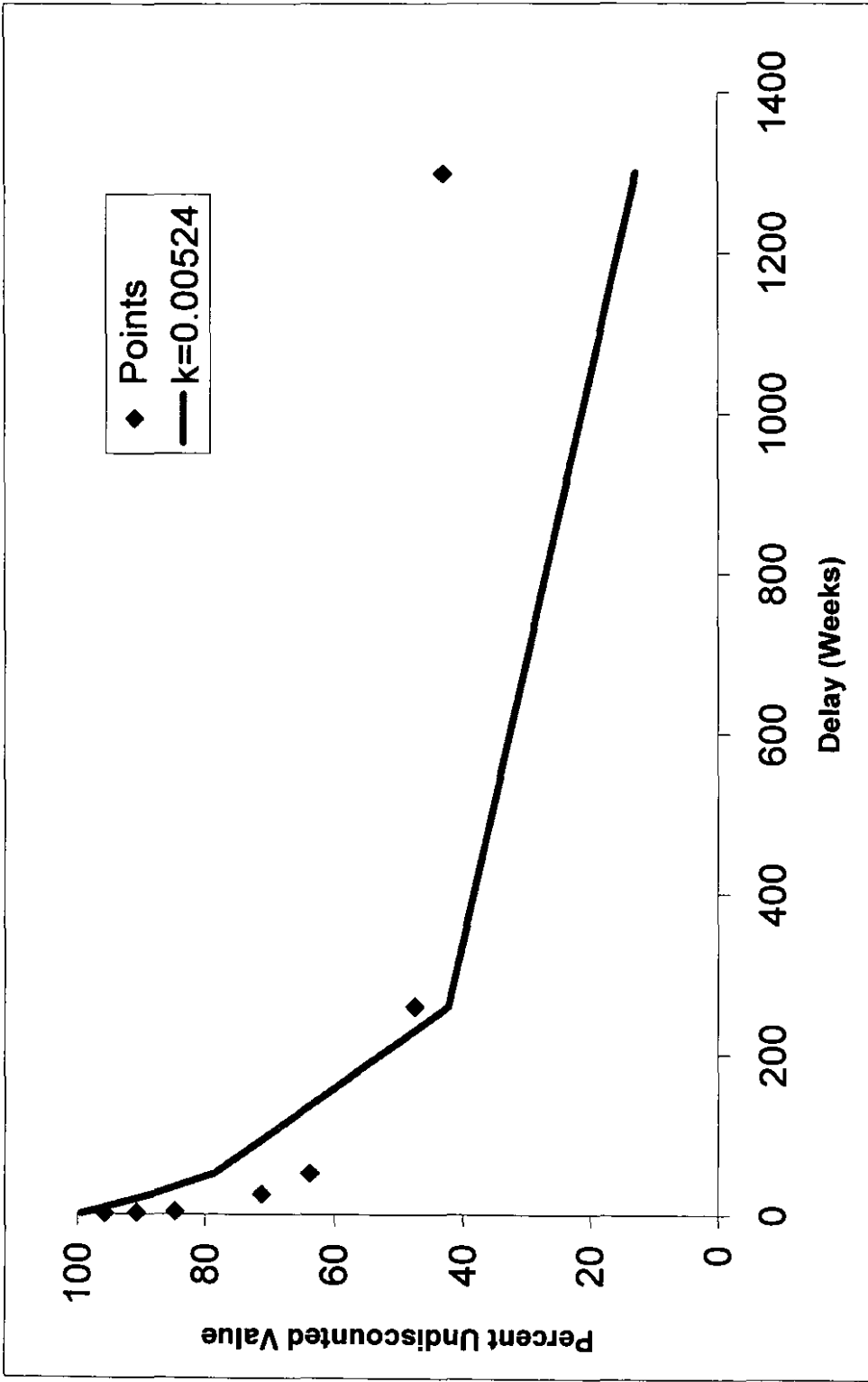
Figure 1. Hypothetical indifference curves showing relative $\underline{K}$ values.
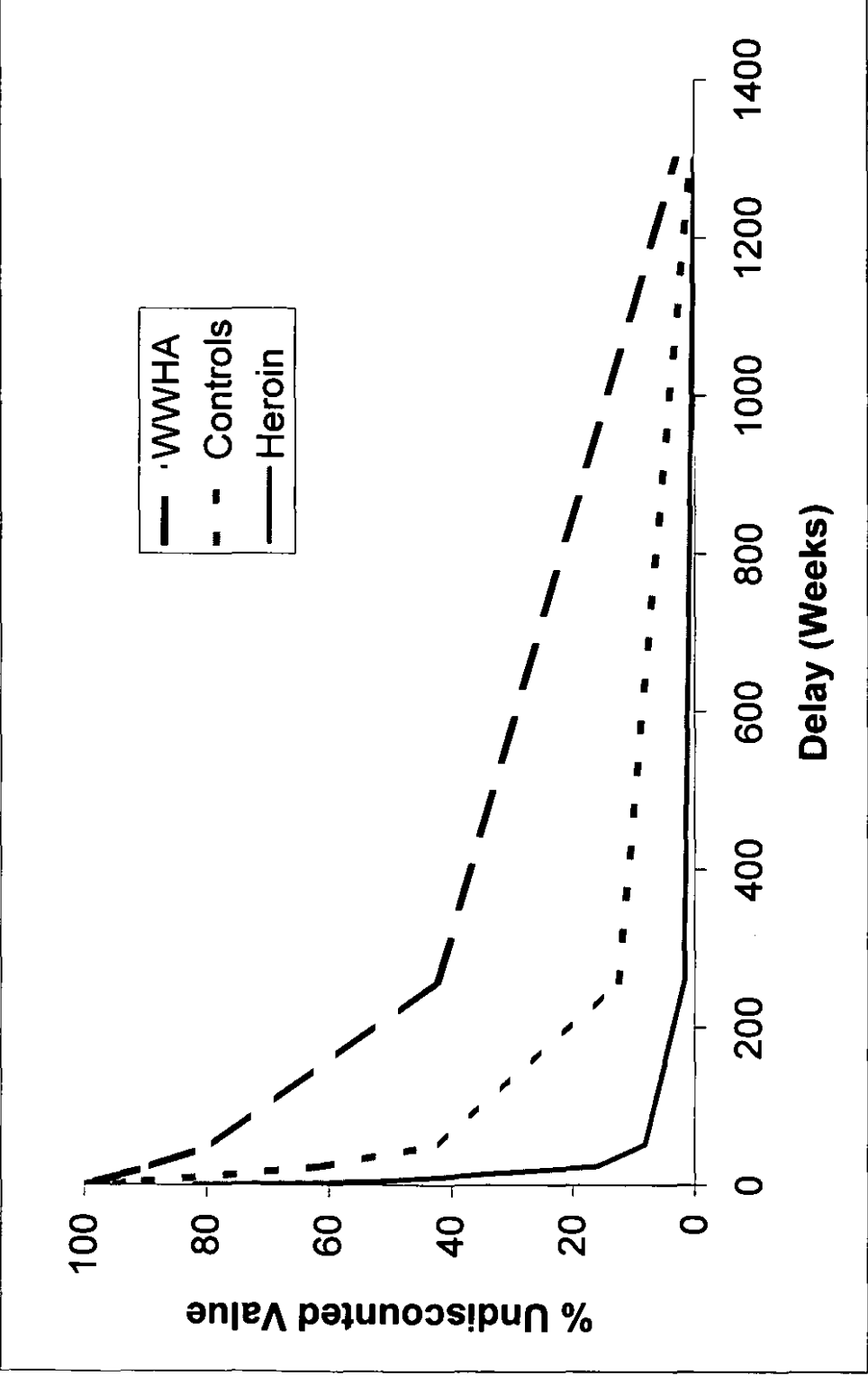
Figure 2. Discounting Curve for Women with Histories of Abuse: Triangles are median values of indifference points, the line is the fit model of discounting ($\underline{K}$ = 0.00524).

Figure 3. Comparison of indifference curves with Equation 1 using $\underline{K}$ values obtained from opioid-dependant participants and matched controls (Madden, et. al 1997) and the women with histories of abuse.

$$V = A/(1+KD)$$

Appendix

Experiment Directions and Explanation: *read the passage below word for word to the subject before the discounting exercise begins. Answer questions at the end of the read instructions.*

"Thank you for volunteering for this study. You have the right to stop the session at any time.

Please wait until the directions have been completely read before you ask questions. All questions will be answered at the end of this explanation.

This study is looking at the different values people put on money when there is a time delay involved. There are no right or wrong answers, and there is no answer that I, the researcher, prefer that you give. It is important that you answer as honestly as you can. Your answer does not reflect any negative attributes to yourself; this is simply an exercise in choice.

Now I am going to ask you about which consequence you would prefer. All of the choices you make are hypothetical, so you will not actually receive the choices you make. Please make your choice as it the consequence would actually happen. There are no correct choices, and your choice does not reflect anything to you personally. This is simply an exercise in discounting, and there are no choices that I would like or expect you to make. Remember that you will not receive any of the money that you choose in this exercise, but it is important that you pretend that this is a real situation. Please give honest answers because there are no right or wrong answers.

Now I am going to ask you to make choices that involve money. Sometimes the questions you are asked may seem repetitive, but all the steps are necessary, so please

take the time to consider each question. The card on your left shows some money that you can have right now. The card on your right shows the money you could have after you wait for a period of time. This means that you are being asked to choose between $1000 now or $1000 after the waiting period (*experimenter verbalizes the waiting period in the card.*) You need only point to the choice that you would prefer. Please point now. (If the participant is demonstrating understanding they will point to the $1000 dollars now. All other discounting experiments have seen this.)

Now I am going to flip through these cards. The amount of money on the cards will change, and you need to point at which reward you would prefer. I am going to continue through my cards and after each time I ask you to pick what choice you would prefer all you need do is point. Are there any Questions I can answer at this point?"